DOI: 10.17765/2176-9206.2021v14n2e7773
e-ISSN: 2176-9206

Analysis of the association between passive smoking and alcohol and drug consumption among adolescents

Análise da associação entre fumo passivo e consumo de álcool e drogas entre adolescentes

Luciano Machado Ferreira Tenório de Oliveira[1], Alison Oliveira da Silva[2], Wanessa Maria Tenório dos Santos[3], Maria Eduarda Pontes dos Santos[4], Mauro Virgílio Gomes de Barros[5], Raphael Mendes Ritti-Dias[6], Paula Rejane Beserra Diniz[7]

[1] Doctor of Medicine-CCS in the area of Neuropsychiatry and Behavioral Sciences at the Federal University of Pernambuco. Adjunct Professor at the Federal University of Pernambuco (UFPE), Recife (PE), Brazil; [2] Master in Physical Education by the Associated Graduate Program in Physical Education (PAPGEF) UPE / UFPB. Professor of the Physical Education course at Centro Universitário Tabosa de Almeida (ASCES - UNITA), Caruaru (PE), Brazil; [3] Graduates in Physiotherapy from Centro Universitário Tabosa de Almeida (ASCES/UNITA), Caruaru (PE), Brazil; [4] Master's student of the post-graduate Program in Neuropsychiatry and Behavioral Sciences (Posneuro), Recife (PE), Brazil; [5] PhD in Human Movement Sciences at the Federal University of Rio Grande do Sul (RS). Associate professor at the University of Pernambuco (UPE), Recife (PE), Brazil; [6] PhD in Public Health from the University of São Paulo. Undergraduate professor at Nove de Julho University, São Paulo (SP), Brazil; [7] PhD in Neuroscience from the University of São Paulo (USP). Adjunct professor in the department of clinical medicine at UFPE, Recife (PE), Brazil.

[*] **Corresponding author**: Maria Eduarda Pontes dos Santos - E-mail *madududa116@gmail.com*

ABSTRACT
To analyze an association between secondhand smoke and alcohol and illicit drug use among adolescents. Epidemiological, descriptive study, with a quantitative approach and state coverage, in a sample of 6,264 adolescents, captured by random sampling by clusters. Data were collected using the Global School-Based Student Health Survey. Pearson's chi-square test (x^2) and binary logistic regression were used in the data analysis. There was a significant exposed to secondhand smoke (70.7%). In addition, it was found that exposure to secondhand smoke was associated with alcohol consumption (OR = 2.04; 95% CI: 1.72 2.42) and illicit drugs (OR = 4.33; 95% CI: 2.72 6.90), even among those adolescents who do not smoke and their parents do not smoke and regardless of gender, age and maternal education. Passive smoking was associated with alcohol and illicit drug use by adolescents, excluding the use of cigarettes by young people and their parents.

Keywords: Epidemiology. Smoking. Teenager. Tobacco smoke pollution.

RESUMO
Analisar a associação entre o fumo passivo e o consumo de álcool e drogas ilícitas entre adolescentes. Estudo epidemiológico, descritivo, com abordagem quantitativa e abrangência estadual, em uma amostra de 6.264 adolescentes, captados por amostragem aleatória por conglomerados. Os dados foram recolhidos por meio do Global School-Based Student Health Survey. O teste do Qui-quadrado de Pearson *(x^2)* e a regressão logística binária foram utilizados nas análises dos dados. Observou-se exposição significante ao fumo passivo (70,7%), e identificou-se que a exposição ao fumo passivo esteve associado com o consumo de álcool (OR = 2,04; IC 95%: 1,722,42) e drogas ilícitas (OR = 4,33; IC 95%: 2,726,90), mesmo entre aqueles adolescentes que não fumam e seus pais não fumam e independentemente do sexo, idade e escolaridade materna. O fumo passivo esteve associado ao consumo de álcool e drogas ilícitas pelos adolescentes, excluindo uso de cigarro por parte dos jovens e dos seus pais.

Palavras-chave: Adolescente. Epidemiologia. Poluição por fumaça de tabaco. Tabagismo.

Received in: February 12, 2020
Accepted on: November 04, 2020

INTRODUCTION

Adolescence is a phase characterized by changes and conflicts that can result in the initiation of unhealthy behaviors, such as smoking, alcohol and illicit drugs consumption,[1-2] and associations between such behaviors can be found.[3-5] The identification of factors associated with such behaviors is important for planning interventions, since such habits increase the risk of mortality among young people.[6]

Exposure to secondhand smoke among adolescents is an important public health issue. Data from the Global Burden of Disease study show that secondhand smoke was responsible for around 331,000 deaths in 2013 and up to 28% of all deaths caused by its exposure occur in children and adolescents.[7] In addition, nonsmokers exposed to cigarette smoke have concentrations of nicotine in their blood that produce psychoactive effects at the same levels as in smokers.[8]

Recent research highlight that the use of alcohol and drugs may be related to the smoking of youngsters[3-5] and their parents.[9] Furthermore, research related to secondhand smoke commonly focuses on harmful physiological repercussions related to exposure to smoke,[10 -11] however, it is not known whether such exposure can be associated with risky behaviors, such as the consumption of alcohol and illicit drugs, and whether such a relationship can be seen in controlling possible confounding variables, such as the smoking of young people and their parents, given the strong association that such behaviors have with secondhand smoke.

The results of this study can be useful to highlight the risk behaviors associated with secondhand smoke and the consumption of alcohol and other drugs in adolescents, which may come to support the development of health promotion strategies for this population. Thus, this study aimed to analyze the association between secondhand smoke and the consumption of alcohol and illicit drugs among adolescents, controlling the confounding variables, including the use of cigarettes by young people and their parents.

METHODOLOGY

This is an epidemiological, descriptive study, with a transversal quantitative approach based on school and statewide coverage. Data collection took place between the first (May and June) and the second semester (August, September, October and November) of 2011.

The sampling procedure was random, by drawing lots, through the randomizer program, and stratified by clusters in two stages "school size" and "class". In the first stage, the size of the school, small (less than 200 students), medium (200 to 499 students) and large (500 students or more) was adopted as a stratification criterion. In the second stage, the shift (day and night) was considered. The regional distribution took into account the number of schools in each of the 17 Regional Education Managements (GREs) in the State of Pernambuco.

To calculate the sample size, the following parameters were adopted: 95% confidence interval; maximum tolerable error of 2 percentage points; drawing effect (deff) = 2; and, because it is a study covering the analysis of multiple risk behaviors and with different frequencies of occurrence, the estimated prevalence of 50% was defined. From these parameters, the minimum sample size was estimated at 5,683 students.

All students in the selected classes were invited to participate in the study, and being regularly enrolled in public high schools in the State of Pernambuco was the inclusion criterion. Inadequate filling of questionnaires, adolescents aged less than 14 years and older than 19 years, absence on the day of application of the instrument or refusal to participate in the research by students and/or guardians were considered as exclusion criteria.

For data collection, a translated and adapted version of the Global School-Based Student Health Survey (GSHS) was used, built and validated for the adolescent population. This instrument was proposed by the World Health Organization (WHO)[12]. A pilot study was carried out to test the applicability of the instrument, with a sample of 86 adolescents aged 14

to 19 years. The indicators of reproducibility showed an intraclass correlation coefficient from moderate to high in most items of the questionnaire, with the coefficients of agreement (kappa index) varying from 0.52 to 1.00.

The dependent variables were alcohol consumption and consumption of illicit drugs. Alcohol consumption was assessed using the question: "In the past 30 days, how many days have you consumed at least one dose of alcoholic drink?" and Tobacco consumption was assessed with the following question: "During the past 30 days, how many days did you smoke cigarettes?". Adolescents who reported having consumed alcohol, tobacco or drugs at least once during the last thirty days were considered "exposed" according to a previous study.[13] The use of illicit drugs was assessed using the question: "During their lifetime, how many times have you used drugs, such as: 'loló' (ether-based aerosol drug), shoemaker's glue (a mixture of organic solvents, including toluene or xylene, used as a psychoactive drug), marijuana, crack, cocaine or others (not considering cigarettes or alcohol)?". Adolescents who reported using any of these substances in life were considered "exposed", taking into account research carried out on drug use among adolescents.[14]

The independent variable was exposure to cigarette smoke through the question: "During the week, how many days does someone smoke in your presence?". Adolescents who reported no days were considered "not exposed". As possible confounding variables, the parents' tobacco consumption was considered, assessed by the adolescents' responses to the question: "Which of your parents or guardians use some form of tobacco?", categorizing in "neither parents smoke", "Only one of parents smoke" and "both parents smoke". In addition, demographic data such as sex, age, place of residence and maternal education were considered.

The tabulation procedure was performed in the EpiData program, version 3.1, using electronic data entry control procedures with the 'CHECK' function. Double entry was used in order to ensure consistency in data entry. All typing errors identified have been corrected. Data analysis was performed using the SPSS 10.0 program for Windows.

Data analysis included descriptive statistics (frequency distribution) and measures of association (Pearson's chi-squared test (2) and binary logistic regression). Binary logistic regressions were performed to analyze the association between secondhand smoke and the use of alcohol, and illicit drugs, controlling the variables gender, age, maternal education, region, parental smoking and cigarette consumption. The criterion used for the entry of variables in the statistical model was $p < 0.20$, using the "Backward" method. The results are demonstrated by estimating the odds ratio (odds ratio = OR) and 95% confidence intervals. For all tests, the significance level adopted was $p < 0.05$.

The research was approved by the Research Ethics Committee with human beings at the University of Pernambuco (CAAE-0158.0.097.000-10/CEP-UPE: 159/10). The subjects' participation was voluntary and anonymous.

RESULTS

Eighty-five schools were visited in 48 cities in all regions of the State of Pernambuco (Metropolitana, Mata Sul, Mata Norte, Agreste Central, Agreste Meridional, Agreste Setentrional, Sertão de Itaparica, Sertão do Araripe, Sertão do Moxotó, Sertão de Itaparica, Sertão Central, Sertão do Pajeú and Sertão do São Francisco). A total of 7,528 students were present in the room, in which 285 students refused to participate or were not authorized to participate by parents or guardians, 84 questionnaires were not properly answered, 908 students were over 19 years old and 12 young people under 14 years old. Thus, 6,239 adolescents (14 and 19 years old) (59.8% girls) were considered eligible. Among adolescents, 70.7% were exposed to cigarette smoke, 4.9% smoked, 28.6% consumed alcoholic beverages, 6.6% used illicit drugs, and 27.5% of young people, had a father and/or mother who smoked, according to Table 1.

Table 1. Socioeconomic, demographic characteristics and prevalence of risk behaviors among adolescents in public schools in the State of Pernambuco, stratified by exposure to cigarette smoke in 2011. (N = 6,239)

Variables	Passive smoking				P-valor
	Not exposed		Exposed		
	n	%	n	%	
Sex					
Male	669	26,7%	1840	73,3%	<0,001
Female	1161	31,2%	2566	68,8%	
Age					
14 – 15	421	31,2%	927	68,8%	
16 – 17	1004	30,2%	2325	69,8%	0,002
18 – 19	406	26,0%	1156	74,0%	
Place of residence					
Urban	1371	29,6%	3255	70,4%	0,414
Rural	452	28,6%	1131	71,4%	
Maternal education					
> 8 years of study	622	32,9%	1271	67,1%	<0,001
≤ 8 years of study	929	26,7%	2551	73,3%	
Parental Tobacco Use (father and / or mother)					
No	1610	36,6%	2793	63,4%	<0,001
Yes	184	11,0%	1488	89,0%	
Cigarette consumption					
No	1810	30,6%	4109	69,4%	<0,001
Yes	18	5,8%	290	94,2%	
Alcohol consumption					
No	1506	33,8%	2945	66,2%	<0,001
Yes	325	18,2%	1457	81,8%	
Consumption of illicit drugs [1]					
No	1789	30,7%	4033	69,3%	<0,001
Yes	41	10,0%	371	90,0%	

[1] loló, shoemaker's glue, launches perfume, marijuana, crack, cocaine and others (not considering cigarette or alcoholic drink)

Being aware of the strong relationship between cigarette consumption (p <0.001) and parental tobacco consumption (father and/or mother) (p <0.001) with secondhand smoke, it was decided to carry out an analysis first including these groups, and later without the referred groups, highlighting the real relationship between secondhand smoke and exposure to alcohol and drugs. Thus, it was identified that secondhand smoke was associated with alcohol consumption (OR = 2.04; 95% CI: 1.72 2.42) and illicit drugs (OR = 4.33; 95% CI: 2.72 6, 90), even among those who do not smoke and whose parents do not smoke, and regardless of gender, age and maternal education (Table 2).

Table 2. Gross and adjusted odds ratio and 95% confidence interval (95% CI) for the association between secondhand smoke and parental smoking, use of cigarettes, alcohol and drugs among adolescents in the public network of the State of Pernambuco in 2011

	Passive smoking					
	All teenagers		Non-smoking teenagers		Non-smoking teenagers and parents who do not smoke	
	(n=6.239)		(n=5.916)		(n=4.206)	
	Adjusted OR†	IC95%	Adjusted OR†	IC95%	Adjusted OR†	IC95%
Cigarette consumption						
No	1					
Yes	6,93*	4,16-11,53				
Parental Tobacco Use (father and / or mother)						
No	1		1			
Yes	4,72*	3,94-5,64	4,71*	3,93-5,65		
Alcohol consumption						
No	1		1		1	
Yes	2,38*	2,05-2,76	2,10*	1,80-2,45	2,04*	1,72-2,42
Consumo de drogas ilícitas[1]						
No	1		1		1	
Yes	3,89*	2,76-5,49	3,14*	2,16-4,55	4,33*	2,72-6,90

† Adjusted for sex, age and maternal education

[1] loló, shoemaker's glue, launches perfume, marijuana, crack, cocaine and others (not considering cigarette or alcoholic drink)

* $p < 0,001$

DISCUSSION

The aim of this study was to analyze the association between secondhand smoke and alcohol and illicit drug use among adolescents, controlling the use of cigarettes by young people and their parents. The main results of this study were: i) high prevalence of adolescents exposed to secondhand smoke ii) boys and those whose mothers have less than eight years of schooling are more exposed to secondhand smoke; ii) even excluding adolescents who smoked and those whose parents smoked, it was found that secondhand smoke can lead young people to consume alcohol and illicit drugs.

In the present study, there was a relevant proportion of adolescents exposed to secondhand smoke (70.7%). This proportion is notably higher when compared to the global average (44.6%) found in a study carried out with adolescents from 25 African countries.[15] In another multicenter study with low and middle income countries the global prevalence of exposure of adolescents to secondhand smoke was 55.9%, ranging from 16.4% in Tajikistan to 85.4% in Indonesia.[16]

The differences in the prevalence rates of exposure to secondhand smoke in adolescents found in the studies may be related to sociodemographic characteristics, the prevalence rate of smoking among adults, and mainly public policies in relation to tobacco use and governmental legislation on smoking between different countries. It is worth mentioning that the prevalence presented in this study is quite high, despite the prohibition of smoking in collective environments in Brazil (Law No. 12,546/2011).

It was noted that boys are more exposed to secondhand smoke when compared to girls. This re-

sult is similar to that found in studies conducted with Malaysian adolescents.[17,18] On the other hand, in a survey conducted with Korean adolescents, it was observed that girls were more exposed to secondhand smoke.[19] This distinction may be related to differences in exposure rates to smoke from different countries, as well as, in the assessment area, exposure to smoke, for example, whether in public, private places and at home.

In this study, it was observed that young people whose mothers had a lower level of education are more exposed to secondhand smoke. In Brazil, data from the National Health Survey (PNS) carried out in 2013, reveals that the population with a lower level of education has almost twice the prevalence of smoking compared to their peers with a higher level of education.[20] Greater access to educational levels or socioeconomic status makes individuals take better care of their health, for example, not smoking and be aware of the harmful effects of exposure to cigarette smoke.[21] Furthermore, smoking is used as a strategy to deal with stressors at the individual level, such as low income and unemployment.[22]

Interestingly, it was noted that secondhand smoke is associated with the consumption of alcohol and illicit drugs. This fact can be explained partly due to the adolescence phase, presenting the need to fit into groups and be accepted by the social environment where they live.[23] Thus, because they are defiant and fearless, and due to the lack of maturity, they become subject to impulsive actions, to behaviors that are vulnerable to oneself and the other.[24] Furthermore, adolescence is marked by vulnerability in the social environment, that is, the susceptibility of people to being exposed to illness, whether physical or psychological, as a result of a set of aspects coming from the individual and their relationship with the collective.[25] This result encourages reflections on the act of smoking, even in open environments, as this habit can stimulate the consumption of drugs harmful to the health of young people.

The present study presents weaknesses and strengths that need to be considered. Among the weaknesses, as it is a cross-sectional study, the associations observed do not necessarily have a cause-effect relationship. Furthermore, the present study did not evaluate the place of exposure to smoke, whether at home or outside in public places. Regarding the strengths, the size and representativeness of the sample are observed, which included adolescents attending schools in rural and urban areas throughout the State of Pernambuco. Another strong point highlighted is the analysis performed with the control of potential confounding factors.

CONCLUSION

This study revealed, in a representative sample of students, that secondhand smoke was associated with the consumption of alcohol and illicit drugs by adolescents, even among those who do not smoke and their parents do not smoke, regardless of gender, age and maternal education. It is recommended that further studies can monitor the negative effects that exposure to secondhand smoke can cause on the health of adolescents throughout time.

REFERENCES

1 Lopes GM, Nobrega BA, Del Prette G, Scivoletto S. Use of psychoactive substances by adolescents: current panorama. Rev. Bras. Psiquiatr. [Internet]. 2013; 35(Suppl 1):S51-S61.

2 Trucco EM. A review of psychosocial factors linked to adolescent substance use. Pharmacology Biochemistry and Behavior. 2020: 172969. https://doi.org/10.1016/j.pbb.2020.172969

3. Hu MC, Griesler PC, Wall MM, Kandel DB. Reciprocal associations between cigarette consumption and DSM IV nicotine dependence criteria in adolescent smokers. Addiction. 2014; 109(9), 1518-28. https://doi.org/10.1111/add.12619

4. Bonilha AG, Ruffino-Netto A, Sicchieri MP, Achcar JA, Rodrigues-Júnior AL, Baddini-Martinez J. Correlates of experimentation with smoking and current cigarette consumption among adolescents. J. bras. pneumol. 2014;40(6):634-42. http://dx.doi.org/10.1590/S1806-37132014000600007

5. Hughes K, Bellis MA, Hardcastle KA, McHale P, Bennett A, Ireland R, *et al.* Associations between e-cigarette access and smoking and drinking behaviours in teenagers. BMC Public Health. 2015;15(1):244. https://doi.org/10.1186/s12889-015-1618-4

6. Ministério da Saúde. Secretaria de Atenção à Saúde, Departamento de Ações Programáticas Estratégicas. Diretrizes nacionais para a atenção integral à saúde de adolescentes e jovens na promoção, proteção e recuperação da saúde: Ministério da Saúde. 2010.

7. Forouzanfar MH, Ashkan A, Lily TA, Anderson HR, Bhutta ZA, Biryukov S et al. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2016; 388: 1659–724. https://doi.org/10.1016/S0140-6736(16)31679-8

8. McGrath JJ, Racicot S, Okoli CTC, Hammond SK, O'Loughlin J. Airborne Nicotine, Secondhand Smoke, and Precursors to Adolescent Smoking. Pediatrics. 2018 Jan;141(Suppl 1):S63-S74. doi: 10.1542/peds.2017-1026J.

9. Oliveira LM, Santos AR, Farah BQ, Ritti-Dias RM, Freitas CM, Diniz PR. Influência do tabagismo parental no consumo de álcool e drogas ilícitas entre adolescentes. Einstein. 2019;17(1):eAO4377. http://dx.doi.org/10.31744/einstein_journal/2019AO4377

10. Figueiro LR, Ziulkoski AL, Dantas DCM. Third-hand smoke: quando o perigo vai além do que se vê ou sente. Cad. Saúde Pública. 2016; 32 (11): e00032216. http://dx.doi.org/10.1590/0102-311x00032216.

11. Moss DR, Lucht LA, Kip KE, Reis SE. Acute physiologic effects of secondhand smoke exposure in children. *Nicotine Tob Res*. 2010;12(7):708-14. doi:10.1093/ntr/ntq069

12. World Health Organization. Global school based student health survey. Geneva: WHO; 2008.

13. Bezerra J, Barros MVG, Tenório MCM, Tassitano RM, Barros SSH, Hallal PC. Religiousness, alcohol consumption and smoking in adolescence. Revista Panamericana de Salud Pública. 2009;26(5):440-6. https://doi.org/10.1590/S1020-49892009001100009

14. Carvalho PDd, Barros MVGd, Lima RA, Santos CM, Mélo EN. Condutas de risco à saúde e indicadores de estresse psicossocial em adolescentes estudantes do Ensino Médio. Cad. Saúde Pública. 2011; 27(11):2095-105

15. Owusu D, Mamudu HM, John RM, Ibrahim A, Ouma AEO, Veeranki SP. Never-smoking adolescents' exposure to secondhand smoke in Africa. American journal of preventive medicine. 2016; 51 (6): 983-98. https://doi.org/10.1016/j.amepre.2016.08.040

16. Xi B, Liang Y, Liu Y, Yan Y, Zhao M, Ma C et al., Tobacco use and second-hand smoke exposure in young adolescents aged 12–15 years: data from 68 low-income and middle-income countries. The Lancet Global Health. 2016; 4, (11) 795-e805. https://doi.org/10.1016/S2214-109X(16)30187-5

17. Mohd GS, Huey TC, Cheong KC, Li LH, Mohd YMF, Yusoff AF et al. Prevalence and factors associated with secondhand smoke exposure among Malaysian adolescents. Tobacco Induced Diseases. 2019;17(22): 1-8. https://doi.org/10.18332/tid/102728

18. Lappas AS, Tzortzi AS, Konstantinidi EM, Dimou N, Behrakis PK. Factors Associated with Exposure to Passive Smoking among 12-18 year-old Students in Athens and Thessaloniki, Greece. Tobacco Prevention & Cessation. 2015;1(7): 1-9. https://doi.org/10.18332/tpc/60652

19. Hwang J, Park SW. Sex and age differences in exposure to secondhand smoke at home among Korean adolescents: A nationally representative survey. Int. J. Environ. Res. Public Health. 2016; 13, (2):241. https://doi.org/10.3390/ijerph13020241

20. Malta DC, Oliveira TP, Vieira ML, Almeida L, Szwarcwald CL. Uso e exposição à fumaça do tabaco no Brasil: resultados da Pesquisa Nacional de Saúde 2013. Epidemiol. Serv. Saúde. 2015; 24 (2): 239-48. https://doi.org/10.5123/S1679-49742015000200006

21. Ribeiro FAC, Moraes MKR, Morais CJC, Silva JN, Lima AS, Parreira SLS, Fernandes VLS. Percepção dos pais a respeito do tabagismo passivo na saúde de seus filhos: um estudo etnográfico. Rev. pau. pediatr. 2015; 33(4), 394-99. http://dx.doi.org/10.1016/j.rpped.2015.02.003

22. Shelley D, Cantrell MJ, Howard JM, Ramjohn DQ, VanDevanter N. The $5 man: the underground economic response to a large cigarette tax increase in New York City. American Journal of Public Health. 2007; 97(8):1483-1488. https://doi.org/10.2105/AJPH.2005.079921

23. Bertol CE, Souza M. Transgressões e adolescência: individualismo, autonomia e representações identitárias. Psicologia: ciência e profissão. 2010; 30(4);824-39.

24. Melo CC, Pichelli AAWS, Ribeiro KCS. Um estudo comparativo entre o consumo de álcool e tabaco por adolescentes: fatores de vulnerabilidade e suas consequências. Revista InterScientia. 2016; 4(1), 21-30.

25. Gasparetto et al. Contextos de vulnerabilidades vivenciados por adolescentes: desafios às políticas públicas. Rev. Bras. Enferm. [Internet]. 2020 73 (Suppl 4): e20190224. Epub Sep 21, 2020. https://doi.org/10.1590/0034-7167-2019-0224.